T-41-63

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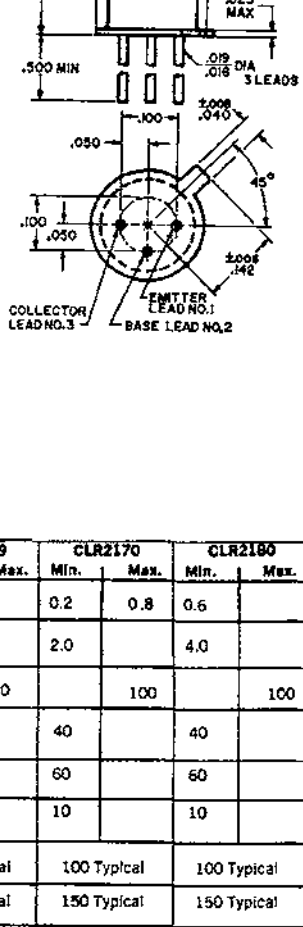
# CLR2169
# CLR2170
# CLR2180
# Silicon NPN Planar Epitaxial Darlington Phototransistors




**GENERAL DESCRIPTION** — The Clairex CLR2169, CLR2170, and CLR2180 are three-lead, silicon planar epitaxial Darlington phototransistors in a lensed-window, hermetic TO-18 package. The initial stage base lead is provided for those applications where circuitry biasing permits additional gain and switching control. The series is characterized for controlled, high sensitivity at very low irradiance levels. The lensed window unit reduces optical cross-talk from stray light.

**ABSOLUTE MAXIMUM RATINGS**

Maximum Temperatures
- Storage Temperature − 65°C to + 200°C
- Operating Junction Temperature + 150°C

Maximum Power Dissipation
- Total Dissipation
- at 25°C Ambient Temperature $P_T$ = 250mW
- derate 2mW/°C
- at 100°C Ambient Temperature $P_T$ = 100mW

| Maximum Voltages | CLR2169 | CLR2170 | CLR2180 |
|---|---|---|---|
| $V_{CBO}$ Collector to Base Voltage | 60 volts | 60 volts | 60 volts |
| $V_{CEO}$ Collector to Emitter Voltage | 40 volts | 40 volts | 40 volts |
| $V_{EBO}$ Emitter to Base Voltage | 10 volts | 10 volts | 10 volts |

Maximum Current: Note 3
- $I_C$ Collector Current 200ma

**ELECTRICAL CHARACTERISTICS** (25°C Free Air unless otherwise designated.)

| Symbol | Characteristics | Test Conditions | CLR2169 Min. | CLR2169 Max. | CLR2170 Min. | CLR2170 Max. | CLR2180 Min. | CLR2180 Max. | Unit |
|---|---|---|---|---|---|---|---|---|---|
| $I_L$ ($I_{CEO}$) | Light Current | $V_{CE}$=5v, H=0.02mW/cm², Note 1 | | | 0.2 | 0.8 | 0.6 | | ma |
| $I_L$ ($I_{CEO}$) | Light Current | $V_{CE}$=5v, H=0.2mW/cm², Note 1 | 0.5 | | 2.0 | | 4.0 | | ma |
| $I_D$ ($I_{CEO}$) | Dark Current | $V_{CE}$=10 volts, H=0 | | 50 | | 100 | | 100 | na |
| $BV_{CEO}$ | Collector to Emitter Breakdown Voltage | $I_C$=0.1ma | 40 | | 40 | | 40 | | volts |
| $BV_{CBO}$ | Collector to Base Breakdown Voltage | $I_C$=0.1ma | 60 | | 60 | | 60 | | volts |
| $BV_{EBO}$ | Emitter to Base Breakdown Voltage | $I_E$=0.1ma | 10 | | 10 | | 10 | | volts |
| $t_r$ | Light Current Rise Time (unsaturated) | $R_L$=100 Ω $I_C$=0.5ma, $V_{CC}$=5.0 volts, Note 2 | 100 Typical | | 100 Typical | | 100 Typical | | μsec |
| $t_f$ | Light Current Fall Time (unsaturated) | | 150 Typical | | 150 Typical | | 150 Typical | | μsec |
| $V_{CE(SAT)}$ | Collector to Emitter Saturation Voltage | $I_C$=10ma, $I_B$=0.05ma H=0 | | 1.2 | | 1.2 | | 1.2 | volts |

**Note 1:** The light source is a frosted tungsten incandescent lamp at 2854°K.
**Note 2:** The light source is a gallium arsenide LED pulsed with a rise and fall time of < 0.3 μsec.
**Note 3:** Pulsed conditions :300μ sec., 2% duty cycle.

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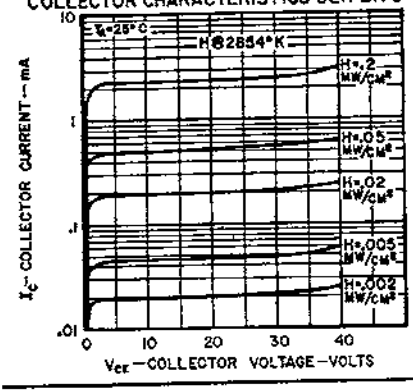
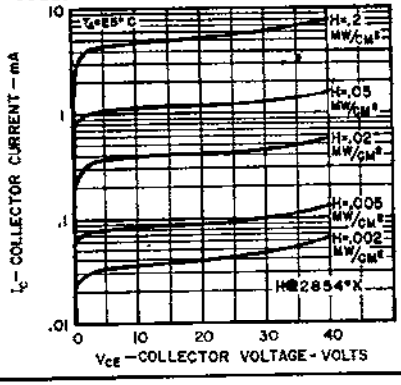
# Typical Electrical Characteristics

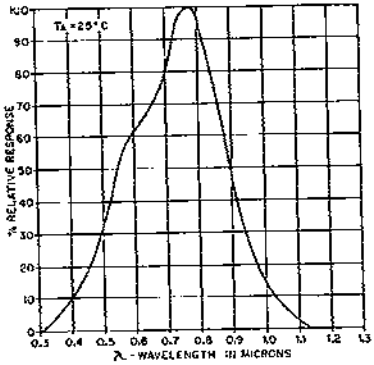
COLLECTOR CHARACTERISTICS CLR 2170



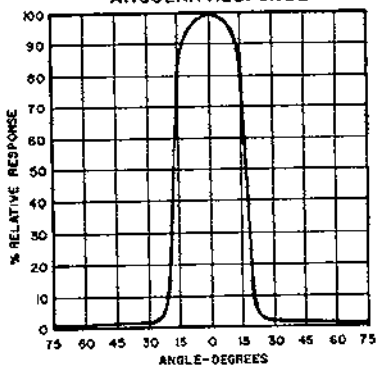

COLLECTOR CHARACTERISTICS CLR 2180




SPECTRAL RESPONSE




ANGULAR RESPONSE




LIGHT CURRENT vs. IRRADIATION

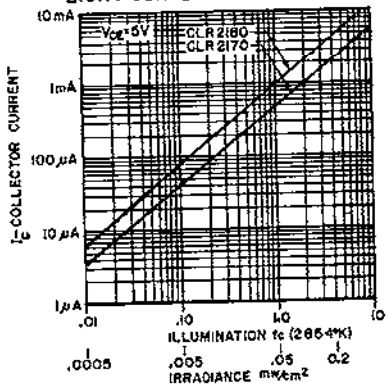
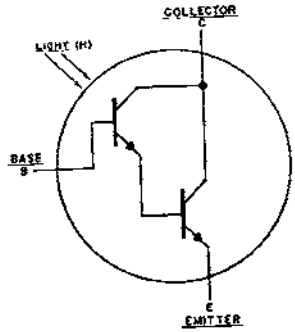



PHOTO-DARLINGTON CIRCUIT

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